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16 November 1953

MEMORANDUM FOR: FE DIVISION

ATTENTION:

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SUBJECT: Test of Firing Devices Mark 12 Model 0 and
Mark 15 Model 0

REFERENCE: Enclosure #2 to Dispatch [] dated
30 July 1953

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The subject report has been reviewed with interest and the following comments are forwarded.

A. In 1948 The Engineer Research & Development Laboratories at Fort Belvoir tested the Mark 15 Model 0 Clockwork Firing Device and considered it unsatisfactory for military purposes. For short intervals the accuracy of the device was very poor, and over the entire range not as good as it should be. Other faults with the device were:

1. Once the device is armed, there is no way to disarm it.
2. When the device is armed and actuated, there is no way of determining the safe time remaining.
3. Once the device is fired, there is no way to rewind it and recock the firing pin so that the device can be used again.
4. Once the time element is set, it cannot be reset or changed to a different time.
5. There is no positive safety.
6. There is no key or can opener to open the tin can in which the device is packed.
7. The firing pin is an unattached unit which can fall out of the device and be lost when the percussion cap base is removed for inspection. This is an especially undesirable feature for night operations.
8. The indexed dial is not luminous for night reading.

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B. The good features of this device are that it is small, compact, easy to use, efficiently designed for space conservation, has good resistance to weathering and water submersion, operates at a low noise level, and possesses the desirable safety feature that it cannot be set for a time delay of less than 15 minutes, which is the minimum dial graduation.

C. On other occasions it has been brought to the attention of this office that both the Mark 12 Model 0 and Mark 15 Model 0 have a tendency to fire prematurely. In all of the Army's tests with the Mark 15 Model 0 approximately 8% fired prematurely, especially in the lower limits.

D. The field has been using these devices as interim items. This office is at present developing a 24-hour clockwork firing device that will eliminate the shortcomings of the Mark 15 Model 0 and satisfy all of the needs for 5 minutes to 24-hour time delays. This device, however, is still in the prototype stage and will not be available to the field for sometime.

E. This office agrees with the recommendations set forth in subject report as follows:

1. For training purposes the insertion of a length of time fuse is perfectly satisfactory.

2. In actual practice the possibility of a premature cannot be overlooked especially in light of paragraph C above. Therefore, this calculated risk is worth taking when the device is set for the longer time delays. It is the recommendation of this office that the Mark 15 Model 0 not be used for delays shorter than 2 hours and then to expect the device to fire slightly ahead of time. Our information concerning the reliability of the Mark 12 Model 0 is not so complete as that on the Mark 15, and the Army did not include it in their tests. This office also recommends that the short time delays be avoided for this device.

3. A final decision as to whether it is Agency policy to use these two firing devices is a matter concerning operational doctrine and training and should be referred to the Paramilitary Operations Staff for their evaluation.

Chief
Mechanical Division, TSS

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Distribution:

Address - Orig. & 1	MD - 1 (Firing Dev., Clockwork - 24 hr. MDS)
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Training Division

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OPERATIONAL RESEARCH REPORT #21

Subject : Test of Firing Devices Mark 12 Model 0 and Mark 15 Model 0
Reference: STSGI #7134 DIR #46866

Pursuant to receipt of cables concerning the unreliability of Firing Devices Mark 12 and Mark 15 Model 0 it was decided to test samples from our small stock on hand. These devices, commonly called Navy Clocks, were designed for underwater use and have been used sparingly in our training program because of their relatively high cost and our meager supply.

Lot Numbers:

Of the Mark 12 firing devices we had a total supply of thirty-one (31) each, some twenty-five (25) of these being received within the last six months in our most recent shipment; the remaining six (6) were left from our initial supply. Test samples taken from the initial supply were marked Lot #2, while the samples taken from the recent shipment were marked Lot #4 and Lot #5 respectively.

Of the Mark 15 firing devices we had a total supply of ninety-six (96) each, some seventy-five (75) of these being received with the same recent shipment of Mark 12 devices. The remaining twenty-one (21) were left from our initial supply. Test samples taken from the initial supply were all marked Lot #2, while the samples taken from the recent shipment were found to be without the usual lot number and naval inspection stamp.

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Copy of 7 CopiesPackaging:

Both the Mark 12 and Mark 15 devices are individually packaged in sealed metal containers. This method of packaging has thus far proven to give the best protection during long term storage in this corrosive climate. All samples tested appeared to be in excellent condition upon removal from their containers.

Method of Testing:

All devices tested were attached by a short length of time fuze to a blasting cap, thus providing safety should a device fire immediately upon arming. The tests were conducted outdoors, the weather being an almost continuous rainfall.

The Mark 12 firing devices, which have a maximum delay of 92 seconds, were timed with a stop watch. The Mark 15 devices, having a maximum delay of eleven hours, were timed with a reliable wrist watch.

Tables of Results:Firing Device Mark 12 Model 0

<u>Test No.</u>	<u>Lot No.</u>	<u>Delay Set</u>	<u>Time Fired</u>	<u>Error</u>
1	2	45 seconds	44.4 seconds	- .6 seconds
2	2	70 seconds	69.0 seconds	-1.0 seconds
3	5	30 seconds	30.4 seconds	✓ .4 seconds
4	4	90 seconds	89.2 seconds	- .8 seconds

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Firing Device Mark 15 Model 0

<u>Test No.</u>	<u>Lot No.</u>	<u>Delay Set</u>	<u>Time Fired</u>	<u>Error</u>
1	2	6 hours	6 hrs. 5 mins.	/ 5 minutes
2	2	8 hours	8 hrs. 7 mins.	/ 7 minutes
3	2	11 hours	Failed to Fire	- - - - -
4	2	2 $\frac{1}{2}$ hours	2 hrs. 14 mins.	-16 minutes
5	None	1 $\frac{1}{2}$ hours	1 hr. 22 mins.	- 8 minutes
6	None	4 hours	3 hrs. 43 mins.	-17 minutes
7	None	1 hour	49 minutes	-11 minutes
8	None	6 hours	5 hrs. 53 mins.	- 7 minutes

Conclusions:

1. In consideration of the fact that these clockwork devices are fully wound from the time of manufacture until they are armed, the relatively small amount of error appears negligible.
2. Failure of the one Mark 15 device set for the maximum delay of 11 hours cannot be considered indicative because of the small number of samples tested.
3. While the possibility of premature firing of time delay devices can never be overlooked, there was no such occurrence in any of the devices tested.

Recommendations:

1. It is recommended that Firing Devices Mark 12 Model 0 and Mark 15 Model 0 be considered satisfactory for use in training with the stipulation that a sufficient length of time fuze

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be connected between the device and the blasting cap for safety purposes in the same manner ^{as} ~~or~~ is already suggested for use with the Firing Device, Delay Type, M-1 (time pencil).

2. It is further recommended that Mark 12 and Mark 15 firing devices be considered satisfactory for operational use with blasting cap attached in the normal manner. The risk of premature firing of the device should be accepted by the agent as a calculated one. The odds are in his favor. The risk is inherent in both the time pencil and clock devices, while the clock devices appear to be more accurate and reliable than the time pencils.

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